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TITLE: Summer Prostate Cancer Research Training Program

PRINCIPAL INVESTIGATOR: David M. Lubaroff, PhD

CONTRACTING ORGANIZATION:
University of Iowa
Iowa City, IA 52242

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PREPARED FOR: U.S. Army Medical Research and Materiel Command
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**14. ABSTRACT**

The HBCU Summer Research Training Program accepted a total of 8 students from Lincoln University for each of the eight week sessions during the summers of 2013, 2014, and 2015. Additional students were accepted for the 2016 summer session. Each student was assigned to a laboratory of a participating mentor and also paired with a member of the mentor's laboratory. This laboratory member assisted with day to day aspects of the research project. During the summer the students work diligently on their research project, participate in meetings of the mentor's laboratory, attend workshops and seminars associated with our and other summer programs, and attend a special course in prostate cancer. We integrate the Lincoln students into social programs held throughout the campus for summer interns. At the end of the summer sessions the students present a poster of the research results from the summer experience. They also present the results of their research in the fall at Lincoln University. Of the students that have graduated from Lincoln, approximately two thirds are attending postgraduate programs.

**15. SUBJECT TERMS**
Summer research; prostate cancer; HBCU institutions

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**Introduction:**

In our initial award (W81XWH-06-1-0266), begun in 2006, we were funded for five students from Lincoln University of Pennsylvania. Because of a large number of qualified student applicants we were funded for additional three students in 2007 (W81XWH-07-1-0241), allowing our program to support a total of eight Lincoln students each summer. We applied for, and were awarded; additional grants (W81XWH-09-1-0270), W81XWH-10-1-0459, W81XWH-12-1-0117), this award W81XWH-13-1-0178, and W81XWH-16-1-0549 after the original grants had been completed. For the year reported here we had the following faculty participants: David M. Lubaroff, PhD, Principal Investigator, Paul Heidger, PhD, University of Iowa Faculty Advisor, Karen Baskerville, PhD, Lincoln University Faculty Advisor, and the following University of Iowa mentors: James Brown, MD; Frederick Domann, PhD; Paloma Giangrande, PhD; Prabhat Goswami, PhD; Yi Luo, PhD; Susan Lutgendorf, PhD; Lyse Norian, PhD; Aliasger Salem, PhD; Michel Schultz, PhD; Andrean Simons-Burnett, PhD; Douglas Spitz, PhD; Chad Tracy, MD; George Weiner, MD; Michael Wright, PhD; and Nicholas Zavazava, MD.

**Body:**

**Recruitment and Admission:**
Brochures, application forms, and posters were designed and printed and sent to Dr. Baskerville at Lincoln and the PI traveled to Lincoln University in January 2013, 2014, and 2015, met with their Faculty Advisors, and Dr. John Chikwem, the Dean of the College of Science and Mathematics. Presentations were made about the summer training program to groups of students at special seminars. Eighteen applications were received for 2013, thirteen for 2014, twenty for 2015, and twenty-three for 2016. The applications were reviewed by the Admissions Committee whose membership consisted of Dr. Lubaroff, Dr. Heidger, Dr. Simons-Burnett, Dr. Domann, Dr. Baskerville, and Dr. Swinton (except for 2016). Admission was offered to a total of 8 students for each year, but one dropped out prior to arrival in 2017 due to a family emergency.

<u>Students Accepted for the 2013 Program</u>
Daniel Appeah
Precious de-Winton Cummings
Jodi-Ann Foster
Jehnae Linkins
Chinenye Onukwugha
Ayanna Raeburn
Nathaniel Sangster
Josephat Wahome

<u>Students accepted for the 2014 Program</u>
Jasmine Brower
Kojo Frimpong
Tamara Jones
Tisha Joseph
Brittany Lindsay
Chinenye Onukwugha
Cashel Payne
Rasheid Smith

Students accepted for the 2015 Program
Seighe Edi
Benney Endoni
LaQuannah Hason
Nnamdi Ihejirika
Abreah Little
Lisa Mwanza
Hasan Slater
Joy Yakie

Nnamdi Ihejirika's brother Patrick was a participant in the 2011 summer program.

Students accepted for the 2016 Program
Kimoni Driver
Nonye Ibik
Ayana McLaren
Chinonso Obidike
Prisca Obidike
Siani Snaith
Destiney Taylor

**Advance Preparation and Information Distribution:**
Following acceptance of the students into the program we assigned each student a mentor based upon his/her choices listed in their applications. Each mentor then assigned a member of the lab as a "big brother/big sister," a person that partners with the student during the 8 week summer session. The mentor also prepared a portfolio of articles covering the area of research the student would be working on, including published papers by the mentor. These materials were sent to the students in advance of their arrival at the University of Iowa.

A six week course on Prostate Cancer was organized with six faculty assigned to deliver lectures. The following represents the course schedule with lecturers:

**Iowa-Lincoln Summer Research Training Program - 2013**
**Prostate Cancer Course**
**Room 2166 MERF**

| **Lecture** | **Date** | **Subject** | Lecturer |
|---|---|---|---|
| Week 1 | June 18 | Introduction to cancer | Spitz |
| Week 2 | June 25 | Basic aspects of prostate cancer | Dahmoush |
| Week 3 | July 2 | Epidemiology of prostate cancer | Gupta |
| Week 4 | July 9 | Genetics of prostate cancer | Domann |
| Week 5 | July 17 | Clinical treatment of prostate cancer | Vaena |
| Week 6 | July 23 | Immunotherapy of prostate cancer | Lubaroff |

**Iowa-Lincoln Summer Research Training Program - 2014**
**Prostate Cancer Course**
**Room 2166 MERF**

| Lecture | Date | Subject | Lecturer |
|---|---|---|---|
| | | | |
| Week 1 | June 17 | Introduction to cancer | Spitz |
| Week 2 | June 24 | Basic aspects of prostate cancer | Dahmoush |
| Week 3 | July 1 | Epidemiology of prostate cancer | Gupta |
| Week 4 | July 8 | Genetics of prostate cancer | Domann |
| Week 5 | July 16 | Clinical treatment of prostate cancer | Vaena |
| Week 6 | July 22 | Immunotherapy of prostate cancer | Lubaroff |

**Iowa-Lincoln Summer Research Training Program - 2015**
**Prostate Cancer Course**
**Room – 2156 MERF**

| Lecture | Date | Time | Subject | Lecturer |
|---|---|---|---|---|
| | | | | |
| Week 1 | June 9 | 9:00 am | Introduction to cancer | Spitz |
| Week 2 | June 23 | 9:00 am | Epidemiology of prostate cancer | Gupta |
| Week 3 | June 30 | 9:00 am | Pathology of prostate cancer | Dahmoush |
| Week 4 | July 7 | 9:00 am | Genetics of prostate cancer | Dupuy |
| Week 5 | July 14 | 9:00 am | Clinical treatment of prostate cancer | Zakharia |
| Week 6 | July 21 | 9:00 am | Immunotherapy of prostate cancer | Lubaroff |

**Iowa-Lincoln Summer Research Training Program - 2016**
**Prostate Cancer Course**
**Room – 2156 MERF***

| Lecture | Date | Time | Subject | Lecturer |
|---|---|---|---|---|
| | | | | |
| Week 1 | June 14 | 9:00 am | Introduction to cancer | Spitz |
| Week 2 | June 21 | 9:00 am | Epidemiology of prostate cancer | Gupta |
| Week 3 | June 28 | 9:00 am | Pathology of prostate cancer | Dahmoush |
| Week 4 | July 5* | 9:00 am | Genetics of prostate cancer | Qi |
| Week 5 | July 12 | 9:00 am | Clinical treatment of prostate cancer | Nepple |
| Week 6 | July 19 | 9:00 am | Immunotherapy of prostate cancer | Lubaroff |

**Key Research Accomplishments**

Each of the students worked on research projects that were part of an overall program within the laboratory of their mentors. As such, it is difficult to identify key research accomplishments for each student research project. Continuation of the research program by each mentor will certainly produce important research findings, aided in part by the summer research of the Lincoln University students. What is key is the mentoring and counseling of the students to aid in their future as scientists in the area of prostate cancer research. The high percentage of the

students that are graduate programs or medical schools is an outstanding accomplishment as these future scientists will most certainly provide key research accomplishments in the years to come.

**Reportable Outcomes:**

The students have reported their findings to the University of Iowa faculty, to the faculty and students at Lincoln University, and at national competitions and conferences. Three of the student's research resulted in her being an author on publications.

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Stanam A, Gibson-Corley KN, Love-Homan L, **Ihejirika** N, Simons AL. Oncotarget. 2016 Oct 12. doi: 10.18632/oncotarget.12590. [Epub ahead of print]

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Eric J. Devor, Jesus Gonzalez-Bosquet, Akshaya Warrier, Henry D. Reyes, **Nonye V. Ibik**, Brandon M. Schickling, Andreea Newtson, Michael J. Goodheart and Kimberly K. International Journal of Oncology 50: 1721-1728, 2017

Eric J. Devor, PhD, Henry D. Reyes, MD, Jesus Gonzalez-Bosquet, MD, PhD, Akshaya Warrier, Susan A. Kenzie, **Nonye V. Ibik**, Marina D. Miller, MD, Brandon M. Schickling, Michael J. Goodheart, MD, Kristina W. Thiel, MD, and Kimberly K. Leslie, MD. Int J Gynecol Cancer 2017;27: 784-790

**Lincoln Student Follow-Up**

| Name | Year | Outcome | School | Current Status |
|---|---|---|---|---|
| Oluwaseun Adekanye | 2006 | medical school | U. Michigan | Physician |
| Shaynah Browne | 2006 | graduate school | U. Mass | research scientist at Mt. Sinai Med. Ctr. |
| Nikesha Haynes | 2006 | graduate school | U. Rochester | research scientist at the Univ. of Rochester |
| Shivaughn Johnson | 2006 | medical school | Ross University Medical School | working |
| Briquel Sherman | 2006 | medical school | University of West Indies | Physician |
| Shaan Spence | 2006 | graduate school | U. South Florida | graduate school |
| Bisola Awoyemi | 2007 | graduate school | Univ. of the District of Columbia | research associate at Dana Farber |
| Seme Diallo | 2007 | graduate school | Drexel University | Research scientist at Medimmune |
| Caroline Dias | 2007 | working | none at this time | working |
| Titilope Idowu | 2007 | working | Morehouse College | Consultant |
| Patrick Ndungu | 2007 | graduate school | University of Iowa | research scientist at Catalyst, Inc |
| Elizabeth Okyne | 2007 | nursing school | U. Iowa | nursing |
| Katrina Probherbs | 2007 | graduate school | Adelphi University | working in healthcare |
| Bukola Fatunmbi (Now Kole Fatunmbi) | 2008 | graduate school | U. Mass | working in science industry |
| Katherine Foster | 2008 | laboratory research | Fox Chase Cancer Center | research assistant in science |
| Theon Francis | 2008 | teaching science | none at this time | teaching science |
| Michelle Gray | 2008 | graduate school | Johns Hopkins | graduate school |
| Julia Greenfield | 2008 | graduate school | U. Maryland | graduate school |
| Gladys Murage | 2008 | graduate school | U. Mass | graduate school |
| Brittany Stokes | 2008 | working in healthcare | none at this time | working in healthcare |
| Stacy-Ann Wright | 2008 | medical school | Ross University Medical School | medical school |
| Kaylene Baugh | 2009 | nursing school | Duke Univ. | nursing school |
| Christina Chisolm | 2009 | graduate school | U. Mass | graduate school |
| Seme Diallo | 2009 | | see 2007 | |
| Elizabeth Okyne | 2009 | | see 2007 | |
| Stephen Sangster | 2009 | teaching science | none at this time | teaching science |
| Keyana Tyree | 2009 | graduate school | Delaware State U./Nebraska | graduate school |

| | | | | |
|---|---|---|---|---|
| Neja White | 2009 | working in healthcare | none at this time | working in healthcare |
| Akede, Theresa | 2010 | graduate school | U. Maryland Baltimore | research scientist |
| Awoyemi, Christiana | 2010 | graduate school | U Texas-Dallas | graduate school |
| Sangster, Stephen | 2010 | | see 2009 | |
| Rand, Stephanie | 2010 | medical school | Thomas Jefferson | resident physician |
| McKnight, Danielle | 2010 | working | none at this time | working |
| Markes, Jhanelle | 2010 | graduate school | U. of Iowa | research associate |
| Holsey, Danielle | 2010 | graduate school | Xiamen Univ. | graduate school |
| Diallo, Chalwe | 2010 | laboratory research | Penn State | research assistant in science |
| Brown, Nakita | 2010 | post baccalaureate | U. Pittsburgh | working in healthcare |
| Baugh, Kaylene | 2010 | | see 2009 | |
| Cooper, Jhoneil | 2011 | graduate school | Drexel University | graduate school |
| Doubt-Swinton, Darah | 2011 | working in healthcare | none at this time | research assistant in science |
| Foster, Jodi-Ann | 2011 | working in science | none at this time | research assistant in science |
| Ihejirika, Patrick | 2011 | graduate school | univ of delaware | graduate school |
| Lynch, Candice | 2011 | graduate school | Nova Southeastern Univ | graduate school |
| Raeburn, Ayanna | 2011 | nursing school | Lincoln | nursing |
| Sangster, Nathaniel | 2011 | teaching science | none at this time | research assistant in science |
| Davis, Lauri-Ann | 2012 | teaching science | Lincoln | working in science |
| Diallo, Chalwe | 2012 | | see 2010 | |
| Ebanks, Shauna | 2012 | graduate school | Penn State | graduate school |
| Ellis, Ashley | 2012 | nursing school | Lincoln | nursing school |
| Jones, Shakeema | 2012 | | ??? | unknown |
| Lynch, Candice | 2012 | | see 2011 | |
| Markes, Jhanelle | 2012 | | see 2010 | |
| Smith, Rasheid | 2012 | graduate school | U of Iowa | graduate school |
| Appeah, Daniel | 2013 | medical school | St. George's & Northumbria | medical school |
| Cummings, Precious | 2013 | graduate school | Univ. of South Florida | graduate school |
| Foster, Jodi-Ann | 2013 | | see 2011 | |
| Linkins, Jehnae | 2013 | graduate school | U. of Delaware | graduate school |
| Onukwhuga, Chinenye | 2013 | | Lincoln | not yet graduated |
| Raeburn, Ayanna | 2013 | | see 2011 | |
| Sangster, Nathaniel | 2013 | | see 2011 | |
| Wahome, Josphat | 2013 | post baccalaureate | Fox Chase Cancer Center | post baccalaureate |
| Brower, Jasmine | 2014 | graduate school | Wilmington University | graduate school |
| Frimpong, Kojo | 2014 | graduate school | Thomas Jefferson | graduate school |
| Joseph, Tisha | 2014 | | Lincoln | not yet graduated |
| Lindsay, Brittany | 2014 | medical school | UK | medical school |

| | | | | |
|---|---|---|---|---|
| Onukwhuga, Chinenye | 2014 | | Lincoln | not yet graduated |
| Payne, Cashel | 2014 | teaching science | Lincoln | teaching science |
| Smith, Rasheid | 2014 | graduate school | U of Iowa | graduate school |
| Edi, Seighe | 2015 | graduate school | Lincoln | graduate school |
| Endoni, Benney | 2015 | working in science | Univ. of Delaware | working in science |
| Hason, Lai Quannah | 2015 | graduate school | Drexel University | graduate school |
| Ihejirika, Nnamdi | 2015 | | Lincoln | not yet graduated |
| Little, Abreah | 2015 | graduate school | Drexel University | graduate school |
| Mwanza, Lisa | 2015 | | Lincoln | not yet graduated |
| Slater, Hasan | 2015 | | Lincoln | not yet graduated |
| Yakie, Joy | 2015 | | Lincoln | not yet graduated |
| Driver, Kimoni | 2016 | | Lincoln | not yet graduated |
| Ibik, Nonye | 2016 | | Lincoln | not yet graduated |
| McLaren, Ayanna | 2016 | | Lincoln | not yet graduated |
| Obidike, Chinonso | 2016 | | Lincoln | not yet graduated |
| Obidike, Prisca | 2016 | | Lincoln | not yet graduated |
| Snaith, Siani | 2016 | | Lincoln | not yet graduated |
| Taylor, Destiney | 2016 | | Lincoln | not yet graduated |

As is evident from the table, of the 49 students that have graduated from Lincoln, 6 (12.2%) are, or have, attended medical schools; 26 (53.1%) are, or have, attended graduate schools; the great majority of the remaining students are in some aspects of science and healthcare. These latter include nursing school, laboratory research, post baccalaureate programs, teaching science, or working in the healthcare environment. Only a relatively few have not continued in science. We are proud of the fact that 65.3% of the graduated students entered medical or graduate schools and overall greater than 91.8% have moved into a medical science career.

It should be noted that all of the students do graduate from Lincoln University. We are basing our calculations on those that have finished matriculating at the school.

**Conclusion**

This award was highly successful as evidenced by the amount of work accomplished by each student and by their motivation to continue in a science career. The PI applied, and received funding, for an additional HBCU training grant that will enable us to continue accepting students for a number of years, thus increasing the number of African American scientists in the area of prostate cancer.

**Appendices:** Brochures for 2013, 2014, 2015, and 2016

University of Iowa Health Care

Holden Comprehensive Cancer Center

Lincoln University of the Commonwealth System of Higher Education 1972 Founded 1854 Lincoln University, Pennsylvania

# 2013

# Prostate Cancer Research Summer Training Program

*A Collaboration Between the University of Iowa and Lincoln University of Pennsylvania*

Students in the 2012 Program

**Summary of Program:** The partnership of the University of Iowa and Lincoln University is designed to provide an outstanding atmosphere to train undergraduate students from Lincoln in prostate cancer research. We propose to have sixteen mentors available for each of the trainees to choose from for their summer research project. The mentors are from seven departments and three colleges at the University of Iowa and the prostate cancer research in their laboratories covers a wide area of interest. The proposed mentors have extensive training experience at all levels; undergraduate, graduate, medical, and postdoctoral.

In addition to the sixteen faculty mentors both the University of Iowa and Lincoln University have designated Faculty Advisors for the students. Dr. Paul Heidger serves as the advisor at the University of Iowa and Dr. Derrick Swinton serves as the advisor at Lincoln University. Both individuals are available for advice and assistance throughout the summer and the regular academic year. The faculty members are listed below as well as a brief description of research in the laboratories of each University of Iowa mentor.

At this point in time the program is 8 weeks long, beginning on Monday, June 10, 2013 and ending on Friday, August 2, 2013.

**Faculty Advisor at Lincoln University:** **Derrick Swinton, PhD.;** Professor and Chair, Department of Chemistry (484-365-7470)
http://www.lincoln.edu/chemistry/index.html

Dr. Swinton is the contact person for the summer program at Lincoln University. He is active in the recruitment, retention, and career planning for our summer students. He also visits the University of Iowa during the program.

## University of Iowa Faculty and Their Research

**Director and Research Mentor:** **David Lubaroff, PhD**; Professor, Department of Urology & Director of the Summer Research Program (319-335-8423)
http://www.medicine.uiowa.edu/dept_primary.aspx?appointment=Urology&id=907659

The work in this laboratory concentrates on the area of tumor immunology with an emphasis on immunotherapy. We have constructed microbial vaccines to be used for the investigation of gene and immunotherapy of prostate cancer. Investigations on the ability of immunized animals to produce immune responses to the transgene product induced by the vaccine are underway. Additionally, we are carrying our "translational" research in the form of clinical trials of our adenovirus vaccine in men with prostate cancer. Important in these trials is the safety of the vaccine and its ability to induce anti-tumor immunity. We have recently completed a Phase I clinical trial of the vaccine that demonstrated its safety. We have initiated a therapeutic Phase II trial. Finally, we have been collaborating on studies of psychosocial effects on immune status in cancer patients.

**Faculty Advisor:** **Paul Heidger, PhD;** Emeritus Professor, Dept. of Anatomy & Cell Biology (319-335-7722)
http://www.anatomy.uiowa.edu/personnel.shtml?id=heidgerp

Dr. Heidger will assist in the recruitment and evaluation of summer students and will assist students in career planning.

## Research Mentors

**James Brown, MD**, Professor, Department of Urology (319-353-8702)
http://www.medicine.uiowa.edu/dept_primary.aspx?appointment=Urology&id=296546

Dr. Brown's clinical practice and research interests focus on urologic oncology, with specific interest in minimally invasive procedures, new techniques, and outcomes. Dr. Brown initiated many of the laparoscopic and robotic programs at his former institution, the Medical College of Georgia, and currently serves as Chair of the urology research protocols evaluation committee. He is the Residency Program Director in the Department of Urology and has trained a large number of individuals that include resident physicians, medical students, and undergraduate students. Dr. Brown's research interest include molecular epidemiology and pathology of urologic cancers.

**Frederick Domann, PhD**; Professor, Dept. of Radiation Oncology. (319-335-8018)
http://www.uiowa.edu/~frrbp/domann_lab.html

The Domann laboratory focuses on how chromatin structure participates in the transcriptional regulation of cancer related genes including oncogenes and tumor suppressor genes. They study the molecular mechanisms by which aberrant cytosine methylation of CpG dinucleotides and post-translational modifications on histones affect gene expression during the development and progression of cancer. A gene of particular interest in their laboratory is the tumor suppressor gene SOD2 that encodes the antioxidant enzyme superoxide dismutase. The lab is also assessing chromatin accessibility in the region of the SOD2 promoter in cells that differentially express the gene. They are currently using conditional knockout mice to study how the loss of SOD2 leads to various pathological conditions, particularly cancer. Future research directions will be aimed at

elucidating the role of cytosine methylation as a mechanism for inactivation of other genes involved in protection against oxidative damage as well as other classical tumor suppressor genes, and to elucidate the mechanism(s) by which CpG methylation can bring about these changes in gene expression.

**Paloma Giangrande, PhD**; Assistant Professor, Department of Internal Medicine (319-384-3242)
http://www.int-med.uiowa.edu/Divisions/HemOnc/Directory/PalomaGiangrande.html

The long term research goals of the Giangrande laboratory are to develop RNA-based tools to modulate cellular pathways underlying pathological cell proliferation in the setting of cancer. Current efforts are focused on selecting RNA aptamers to receptors expressed on the surface of target cells with SELEX (Systematic Evolution of Ligands by Exponential Enrichment) for the purpose of (1) modulating receptor function and/or (2) delivering therapeutic molecules (e.g. siRNAs, antimirs, small molecule drugs) into specific cell types. Emerging interests include the development of diagnostic tools for imaging cancers and cardiovascular disease *in vivo*. The lab approaches these goals using both cell-based and animal models of disease progression and in collaboration with clinicians in the Pathology, Urology and Oncology Departments at the University of Iowa and other institutions. A major project in the lab is targeted therapy of prostate cancer using PSMA-guided aptamers.

**Prabhat Goswami, PhD;** Professor, Department of Radiation Oncology (319-384-4666)
http://www.uiowa.edu/~frrbp/goswami.html

Dr. Goswami is an expert in the redox biology of the cell cycle research. He is well known for his innovative concept of a "*redox cycle within the cell cycle*", linking oxidative metabolic processes to cell cycle regulatory processes. He demonstrated that a "ROS-Switch" regulates transitions between quiescent and proliferative growth states; a superoxide-signaling regulates proliferation and a hydrogen peroxide-signaling supports quiescence. Dr. Goswami is an active member of the Holden Comprehensive Cancer Center (HCCC) of The University of Iowa. He is the Co-director of the Radiation and Free Radical Research Core of the HCCC and he supervises the Radiation Core facility. Dr. Goswami has served as an *ad hoc* reviewer in ten NIH Study Sections including a P01 review. He has also served as a scientific reviewer for the DOD, DOE, NASA, RSNA, and Komen Breast Cancer Foundation. Dr. Goswami has published 68 peer reviewed publications and successfully trained 7 PhD graduate students and 3 postdoctoral fellows. Dr. Goswami is currently mentoring 2 PhD, 1 M2, and 2 undergraduate students. Dr. Goswami is a faculty member in the Interdisciplinary Molecular and Cellular Biology, and Human Toxicology Graduate Programs.

**Michael Henry, PhD**; Associate Professor, Department of Physiology & Biophysics (319-335-7886)
http://www.physiology.uiowa.edu/henry.shtml?menu=1&tab=facultyTab

The long term research goals of the Henry laboratory are to understand the molecular and cellular basis of prostate cancer progression and metastasis in order to develop new methods for the diagnosis and treatment of this disease. Current efforts are focused on the role of a cell-matrix receptor dystroglycan and epithelial-mesenchymal transition in this process. The lab approaches this problem using both cell-based and animal models of disease progression. Emerging interests include how physiological and environmental components interact with central genetic pathways related to disease progression, including the influence of diet-induced obesity. Dr. Henry has extensive experience in basic mechanisms of cell signaling and cancer biology as well as drug discovery and development both in industry and academic settings. His expertise extends from elucidating basic signaling pathways related to cancer progression to various approaches for therapeutic intervention in these pathways including large molecule-targeted delivery of anticancer agents and discovery of small molecule drugs.

**Yi Luo, MD, PhD**; Associate Professor, Department of Urology (319-335-9835)
http://www.uihealthcare.com/depts/med/urology/urologymds/luo.html

A major research project in our laboratory is to develop a novel therapeutic strategy to cope with the limitations of the current modalities for prostate cancer treatment. We will use prostate-specific antigen (PSA), a protein known to be aberrantly expressed in prostate cancer, as a target for immunotherapy of prostate cancer. In fact, PSA has been demonstrated to be a useful immunotherapeutic target in clinical trials as well as in animal models. In addition, PSA has also been demonstrated to be antigenic and capable of inducing specific immune responses in both humans and mice. However, up to date, all currently available PSA-targeted immunotherapies have only demonstrated limited antitumor effects. To improve this immunotherapeutic approach, we will use both bacillus Calmette-Guérin (BCG, a bacterial vaccine strain) and adenovirus (Ad, a replication-defective strain) to deliver PSA for animal immunization. Both BCG and Ad microbes

have been demonstrated to be safe and effective for antigen delivery in humans and mice. Since these two microbes are known to be different in their infectious modes and host anti-infection responses, rationally combined use of BCG and Ad recombinants for vaccination will provide a synergistic/complementary immune induction and thus likely result in enhanced antitumor immunity. Indeed, we have previously observed a robust induction of PSA-specific T cell responses by vaccination with combined BCG-PSA (primer vaccine) and Ad-PSA (booster vaccine) in mice. In this study, we will further evaluate the effects of this vaccination method on preventing or treating experimental prostate tumors. The objective of this study is to provide a proof of principle that enhanced antitumor immunity can be achieved by combined vaccination with BCG and Ad recombinants.

**Lyse Norian, PhD;** Assistant Professor, Department of Urology (319-335-3013)
http://www.medicine.uiowa.edu/dept_primary.aspx?appointment=Urology&id=569305

The Norian laboratory studies the causes of tumor-induced immune dysfunction in the presence and absence of obesity and the use of immunotherapies to treat cancers. Immunotherapy is a promising approach for the treatment of advanced solid tumors, but progress in this area is impeded by the fact that growing tumors suppress protective immunity in a variety of ways. Dr. Norian uses cellular and molecular techniques to explore the nature of tumor-derived dendritic cell (DC) and T cell functional deficiencies. Long-term goals are to develop novel, immune-based therapies for advanced solid tumors, using the knowledge we gain from our pre-clinical studies. Because her goal is to ultimately apply findings to the clinical setting, she is also interested in understanding how co-morbidities such as obesity impact protective immune responses in the presence and absence of tumor growth. Due to her affiliation with the Department of Urology, the laboratory has access to clinicians and human samples that can help translate murine studies into clinical application. Murine tumor models routinely used include: metastatic renal cell carcinoma (Renca), localized and metastatic prostate cancer (RM-11), spontaneous breast cancer (NeuT), metastatic breast cancer (4T1), and localized fibrosarcoma (CMS5). The use of multiple models helps to substantiate findings across multiple murine models.

**Aliasger K. Salem, PhD**; Associate Professor, Division of Pharmaceutics, College of Pharmacy (319-335-8810)
http://www.pharmacy.uiowa.edu/pharmaceutics/people/Salem.htm

Dr. Salem's research interests are primarily focused on self-assembling systems, the rational design of novel drug and gene delivery systems and on the development of sophisticated scaffolds for tissue-specific regeneration. In tissue engineering, Dr. Salem's laboratory applies microfabrication techniques to novel biomaterials to provide spatial control over tissue formation and to integrate minimally invasive scaffold delivery strategies. In drug/gene delivery, he is currently exploring the synergistic application of degradable particle technology, CpG oligonucleotides and heat shock proteins for generating sustained immunotherapeutic responses against cancer. Dr. Salem's laboratory also collaborates with Dr. Lubaroff on the use of microparticles in association with cancer vaccines fro the induction of strong anti-tumor immune responses and tumor destruction.

**Michael Schultz, PhD**; Assistant Professor, Department of Radiology (319-356-4159)
http://www.medicine.uiowa.edu/Radiology/faculty-staff/faculty/schultz-michael.html

Dr. Schultz is a tenure track Assistant Professor at the University of Iowa in the Department of Radiology and a subject matter expert in the molecular design, organic synthesis, characterization, and radiolabeling of peptides and small molecules for small molecule cancer therapy, molecular imaging, and radionuclide therapy for cancer. He has participated in the Lincoln University program for three years and enjoys bringing the students into his lab and mentoring them for the summer session. Dr. Schultz feels that the students bring enthusiasm and provide an excellent opportunity for his graduate researchers to practice mentoring skills and begin to understand the process of teaching science. He has been very pleased with the contribution that the students make to the research efforts of his laboratory. Thus, he finds the program to be highly beneficial to his laboratory and looks forward to further opportunities to participate. The Schultz lab also works to identify key cell-surface receptor residues as targets for novel peptide- and aptamer-based receptor agonists and antagonists — and become proficient in manipulating the molecular characteristics of these targeting vectors in order to optimize their pharmacokinetic and biodistribution properties for imaging and therapy of cancer. An active collaboration exists between Drs. Schultz and Giangrande.

**Andrean Simons-Burnett, PhD;** Assistant Professor, Department of Radiation Oncology (319-384-4450)
http://www.medicine.uiowa.edu/dept_primary.aspx?appointment=Pathology&id=435085

Dr. Simons-Burnett has been an active participant in the summer program, previously acting as a "big sister" to students while a member of Dr. Douglas Spitz's laboratory. Her research interests include metabolic oxidative stress in tumors and the role oxidative stress plays in signal transduction pathways. Her current interests focus on the EGFR/PI3K/Akt signaling pathway and its involvement with NADPH oxidase activation, glucose metabolism and autophagy in cancer. Additionally she is interested in investigating novel combined modality therapies that target the EGFR/PI3K/Akt pathway and how one can predict sensitivity to these therapies in cancer disease sites.

**Elaine Smith, PhD**; Professor, Department of Epidemiology, College of Public Health (319-384-5014)
http://www.public-health.uiowa.edu/faculty-staff/faculty/directory/faculty-detail.asp?emailAddress=elaine-smith@uiowa.edu

Dr. Smith, a recent addition to our mentors, is a Professor of Epidemiology in the College of Public Health. She has a number of research interests that will benefit training of our summer students. These include etiology of oncogenic diseases, focused on molecular epidemiology, HPV effects on the development of genital and other cancers; hormones and risk of HPV detection and replication; HPV and perinatal vertical transmission, head and neck cancers and reproductive diseases: HPV and vestibulitis; prostate cancer risk associated with pesticides and sex steroid hormone alterations.

**Douglas Spitz, PhD**; Professor, Department of Radiation Oncology (319-335-8001)
http://www.uiowa.edu/~frrbp/spitz_lab.html

Dr. Spitz's laboratory was the first to discover that chronic exposure of mammalian cells to $O^{2\bullet}$- and $H_2O_2$ was capable of inducing genomic instability and gene amplification that resulted in a large increase cellular resistance to oxidative stress associated with cancer therapy. His laboratory was also the first to discover that glucose deprivation preferentially killed cancer vs. normal cells by metabolic oxidative stress mediated by mitochondrial $O^{2\bullet}$- and $H_2O_2$. In this work his lab also showed that tumor cell mitochondria were producing much greater levels of $O^{2\bullet}$- and $H_2O_2$, relative to normal cells and this apparent defect in cancer cell mitochondrial metabolism could be exploited for therapeutic purposes. This work continues to have a significant impact on the field cancer biology and therapy using ketogenic diets to enhance cancer therapy based on these basic science observations. He has also collaborated on the discovery of the role that Sirt3 plays in maintenance of mitochondrial oxidative metabolism during stress leading to malignant transformation and the fact that MnSOD is a target for Sirt3 activation during ionizing radiation-induced injury relevant to transformation and normal tissue damage during radiotherapy. Dr. Spitz is also a well-established mentor for trainees and junior faculty. He serves as the director of the Biosciences Graduate Program and the Free Radical and Radiation Biology Graduate Program at the University of Iowa as well as the director of the Radiation and Free Radical Research Core Laboratory and the Free Radical Cancer Biology Program in the Holden Comprehensive Cancer Center.

**Chad Tracy, MD**, Assistant Professor, Department of Urology (319-384-9183)
http://www.medicine.uiowa.edu/dept_primary.aspx?appointment=Urology&id=938613

Dr. Tracy is a Clinical Assistant Professor in the Department of Urology. He will be working as a faculty member in the mentoring of trainees in prostate cancer research. He has extensive experience with prostate cancer surgery as it is one of the main areas of his clinical expertise. Currently, he performs more prostate cancer surgery than any other physician in the Department of Urology. Additionally, he has worked on several research projects within the department that focus on prostate cancer including having helped with the development of a prospective study on outcomes after prostatectomy. Dr. Tracy has, in addition, contributed patients for study of circulating tumor cells before and after prostatectomy, and, more recently, helped to develop a prospective study of antibiotic prophylaxis for use in the peri-procedural period surrounding prostate biopsy. Dr. Tracy is a new mentor in the summer program.

**George Weiner, MD**; Professor, Department of Internal Medicine and Director, Holden Comprehensive Cancer Center (319-353-8620)
http://www.healthcare.uiowa.edu/Labs/Weiner/

The laboratory of Dr. George Weiner focuses on exploring methods to enhance the efficacy of monoclonal antibody therapy of cancer. Preclinical and clinical studies are exploring the relative role of various effector cells in antibody dependent cellular cytotoxicity, how complement impacts on the efficacy of monoclonal antibody therapy and how therapy can be improved. Dr. Weiner's laboratory is also evaluating the use of other immunotherapy agents such as immunostimulatory CpG oligodeoxynucleotides (CpG ODN). He works

closely with Dr. Brian Link who leads the clinical research aspects of their collaborative research program. Dr. Weiner is the Director of the University of Iowa Holden Comprehensive Cancer Center, and of the Iowa/Mayo Clinic Specialized Program of Research Excellence (SPORE) in lymphoma. He is also the principal investigator of additional research grants from the National Cancer Institute and the Leukemia and Lymphoma Society in the field of immunotherapy of cancer.

**Michael Wright, PhD**; Assistant Professor, Department of Molecular Physiology & Biophysics (319-384-1764)
http://www.physiology.uiowa.edu/wright.shtml?menu=1&tab=facultyTab

The laboratory of Dr. Wright is applying cutting-edge quantitative mass spectrometry technologies to study cellular signaling at the molecular level in model systems of disease. They are developing novel experimental workflows to globally profile proteins and delineate protein complexes isolated from cells and tissues using directed and targeted mass spectrometry methods. Dr. Wright is particularly interested identifying post-translational modifications on proteins and determining how these modifications control the function, stability, and localization of proteins implicated in human diseases. He is determining how androgen-signaling pathways influence the pathophysiology of prostate cancer by building quantitative models of androgen-signaling at the level of proteins to understand how molecular effectors influence AR function before and after binding androgenic ligands. The lab is elucidating androgen-signaling networks at three primary levels: 1) mapping androgen-sensitive protein pathways, 2) mapping androgen-sensitive kinase pathways, and 3) identifying androgen receptor-interacting protein complexes in model cellular systems of prostate cancer. The group is also interested in identifying plasma glycoprotein biomarkers to distinguish indolent and aggressive prostate cancer in patients with organ-confined disease. Overall, the long-term goal of Dr. Wright's research program is to identify prognostic and therapeutic biomarkers in the management and treatment of prostate cancer.

**Nicholas Zavazava, MD, PhD**; Professor, Department of Internal Medicine (319-384-6577)
http://www.int-med.uiowa.edu/Divisions/Immunology/Directory/NicholasZavazava.html

The Zavazava laboratory has recently discovered a novel protein, Ym1 which abrogates tumor growth in multiple tumors. They are currently trying to understand the mechanism by which NK cells are activated by this protein. The student from Lincoln will be immersed in these studies. Dr. Zavazava proposes to extend these studies to prostate cancer and determine if this protein can be used as a novel therapeutic agent. This lab has trained many trainees who have moved on to be leaders at a number of institutions. Others have moved on into Pharmaceutical industry. The work in the laboratory has been recognized with several Young Investigator Awards from the American Transplantation Congress. One of our abstracts was rated the best of all abstracts submitted at the 2009 American Transplantation Congress meeting in Boston. Dr. Zavazava currently supervises 3 postdoctoral fellows, 3 graduate students,

**Research Facilities -** The research laboratories of the faculty mentors at the University of Iowa are located on the west side of Iowa City on the Health Sciences Campus. The facilities include the Medical Laboratories, Bowen Sciences Building, Pharmacy Building, UI General Hospital, Medical Education and Biomedical Research Facility, Carver Biomedical Research Building, and the Veterans Affairs Medical Center. Support for the research is provided by a large number of Shared Core Facilities that include the Gene Transfer Vector Core, DNA Core, Flow Cytometry Core, to name but a few. For research that includes laboratory animals, professional, humane veterinary care is provided by the Animal Care Facilities of the University of Iowa and the Veterans Affairs Medical Center.

**Opportunities for Learning -** Students will have a large number of opportunities to learn about research, prostate cancer, and cancer in general. These include meeting with other members of the HBCU SRT and mentors, joint laboratory meetings with other investigators collaborating with the mentor, journal clubs, and a six-week course designed to educate the students about prostate cancer, its origins, genetics, epidemiology, and treatment.

**Living in Iowa City for the Summer**

**Housing and Meals** - All students will be housed in the Mayflower Residence Hall on the Campus of the University of Iowa. It is conveniently located on the northern edge of the campus and is served by the free Cambus transportation system. The Mayflower has kitchen facilities and double air conditioned rooms. The living quarters are also across the Iowa River from the Iowa City Park

**Arrival and Welcome** – For the 8 week program, students will be expected to arrive on Sunday, June 9, 2013. Flights by most major airlines are available to the Cedar Rapids Eastern Iowa Airport (CID). These include American, Delta, and United Airlines. A welcoming barbecue will be held on Sunday, June 9th with members of other summer research programs that include the Iowa Biosciences Advantage, and the Student Summer Research Opportunities Program.

**Activities In and Around Iowa City -** There are a number of activities in the Iowa City Area that students can find during the summer research program. These include, but are not limited to, the following:

*Friday and Saturday Night Concert Series* – Free musical concerts held each Friday and Saturday night from 6:30 to 9:30 pm on the downtown Pedestrian Mall.

*Iowa City Jazz Festival* – A free, three-day jazz concert featuring local, regional, and national jazz groups during the July 4th celebration. The festival will be held on the Pentacrest on the campus of the University of Iowa.

*Thursday Night Concerts in Coralville* – These musical concerts, held in Morrison Park in the adjacent town of Coralville, IA, are also free and open to the public.

*Saturday Night Free Movies Series* – This is the newest addition to Iowa City's long tradition of free, outdoor family-friendly entertainment that literally brings our community together. It is held outdoors on the Pentacrest from June through August.

*Other Activities* – there are a large number of indoor & outdoor activities that can be accessed through the Cities of Iowa City and Coralville and the University of Iowa. These include exercise facilities (running, tennis, basketball, volleyball, handball/racquetball, weights, biking, and swimming), local beaches, and museums (art, natural history, and sports). In addition, there are a large number of restaurants ranging from fast food to fine dining.

**Application to the Program -** Application forms, distributed with this brochure, must be completed and returned either to Dr. Swinton at Lincoln University or to Dr. Lubaroff at the University of Iowa. **The deadline for submission is March 1, 2013.** A committee composed of Dr. Swinton, Dr. Lubaroff, Dr. Heidger and two additional faculty from the University of Iowa will meet and make final decisions. Students will be notified of the decisions no later than March 15, 2013 pending prompt receipt of all applications.

**Financial Support -** The housing, meal, and transportation costs will be paid by the program. In addition, each student will be provided a stipend, the amount of which is currently being negotiated with the University of Iowa and Lincoln University.

For additional information please contact one of the following:

David Lubaroff, PhD, Department of Urology, University of Iowa, 375 Newton Road, 3210 MERF, Iowa City, IA 52242; 319-335-8423; david-lubaroff@uiowa.edu

Paul Heidger, PhD, Department of Anatomy & Cell Biology, University of Iowa, 51 Newton Road, Iowa City, IA 52242; 319-335-7722; paul-heidger@uiowa.edu.

Derrick Swinton, PhD, Department of Analytical Chemistry, Lincoln University, 1570 Baltimore Pike, Lincoln University, PA 19352; 610-932-8300, ext. 3470; dswinton@lincoln.edu

Diane Morman, Program Coordinator, Department of Urology, University of Iowa, 375 Newton Road, 3209 MERF, Iowa City, IA 52242; 319-335-8425; diane-morman@uiowa.edu

UNIVERSITY of IOWA HEALTH CARE

*Holden Comprehensive Cancer Center*


University of Iowa Health Care

Holden Comprehensive Cancer Center

The Lincoln University 1854

# 2014

# Prostate Cancer Research Summer Training Program

*A Collaboration Between the University of Iowa and The Lincoln University*

Students in the 2013 Program

**Summary of Program:** The partnership of the University of Iowa and Lincoln University is designed to provide an outstanding atmosphere to train undergraduate students from Lincoln in prostate cancer research. We propose to have sixteen mentors available for each of the trainees to choose from for their summer research project. The mentors are from seven departments and three colleges at the University of Iowa and the prostate cancer research in their laboratories covers a wide area of interest. The proposed mentors have extensive training experience at all levels; undergraduate, graduate, medical, and postdoctoral.

In addition to the sixteen faculty mentors both the University of Iowa and Lincoln University have designated Faculty Advisors for the students. Dr. Paul Heidger serves as the advisor at the University of Iowa and Dr. Derrick Swinton and Dr. Karen Baskerville serve as the advisors at Lincoln University. All of the individuals are available for advice and assistance throughout the summer and the regular academic year. The faculty members are listed below as well as a brief description of research in the laboratories of each University of Iowa mentor.

At this point in time the program is 8 weeks long, beginning on Monday, June 9, 2014 and ending on Friday, August 1, 2014.

## Faculty Advisors at Lincoln University:

**Derrick Swinton, PhD.;** Associate Professor and Chair, Department of Chemistry (484-365-7470)
http://www.lincoln.edu/chemistry/index.html

**Karen Baskerville, PhD.**; Associate Professor and Chair, Department of Biology (484-365-7507)
http://www.lincoln.edu/biology/index.html

Drs. Swinton and Baskerville are the contact people for the summer program at Lincoln University. They are active in the recruitment, retention, and career planning for our summer students. They also visit the University of Iowa during the summer program.

## University of Iowa Faculty and Their Research

**Director and Research Mentor: David Lubaroff, PhD**; Professor, Department of Urology & Director of the Summer Research Program (319-335-8423)
http://www.medicine.uiowa.edu/dept_primary.aspx?appointment=Urology&id=907659

The work in this laboratory concentrates on the area of tumor immunology with an emphasis on immunotherapy. We have constructed microbial vaccines to be used for the investigation of gene and immunotherapy of prostate cancer. Investigations on the ability of immunized animals to produce immune responses to the transgene product induced by the vaccine are underway. Additionally, we are carrying our "translational" research in the form of clinical trials of our adenovirus vaccine in men with prostate cancer. Important in these trials is the safety of the vaccine and its ability to induce anti-tumor immunity. We have recently completed a Phase I clinical trial of the vaccine that demonstrated its safety. We have initiated a therapeutic Phase II trial. Finally, we have been collaborating on studies of psychosocial effects on immune status in cancer patients.

**Faculty Advisor: Paul Heidger, PhD;** Emeritus Professor, Dept. of Anatomy & Cell Biology (319-335-7722)
http://www.anatomy.uiowa.edu/personnel.shtml?id=heidgerp

Dr. Heidger will assist in the recruitment and evaluation of summer students and will assist students in career planning. He works with students during the summer to facilitate interviews with members of the graduate training programs, the MD/PhD program, and the Carver College of Medicine.

## Research Mentors

**James Brown, MD**, Professor, Department of Urology (319-353-8702)
http://www.medicine.uiowa.edu/dept_primary.aspx?appointment=Urology&id=296546

Dr. Brown's clinical practice and research interests focus on urologic oncology, with specific interest in minimally invasive procedures, new techniques, and outcomes. Dr. Brown initiated many of the laparoscopic and robotic programs at his former institution, the Medical College of Georgia, and currently serves as Chair of the urology research protocols evaluation committee. He is the Residency Program Director in the Department of Urology and has trained a large number of individuals that include resident physicians, medical students, and undergraduate students. Dr. Brown's research interest include molecular epidemiology and pathology of urologic cancers.

**Eric Devor, PhD**; Research Assistant Professor, Department of Obstetrics & Gynecology (319-335-8212)
http://www.medicine.uiowa.edu/dept_primary_apr.aspx?appointment=Obstetrics%20and%20Gynecology&id=edevor

Current research is focused on the role of a unique protein called placenta-specific 1 (PLAC1) in both gynecologic cancers and gestational disorders such as pre-eclampsia and pre-term birth. PLAC1 is expressed in numerous tissues during fetal

development, exclusively in placental trophoblasts in reproductive age women and in gynecologic tumors. It is, thus, the only known example of an onco-fetal-placental protein. The Devor research spans the range of PLAC1 questions from its role in disorders such as those noted above to how the gene is regulated in these various tissues to its detailed evolutionary history in placental mammals.

**Melissa Fath, PhD**; Assistant Research Scientist, Department of Radiation Oncology (319-335-8025) http://www.uiowa.edu/~frrbp/secondary/fath.html

Cancer cells have alterations in mitochondrial respiration that are more likely to cause univalent reduction of $O_2$ to form reactive oxygen species, including hydroperoxides, resulting in a chronic condition of metabolic oxidative stress. Increased glucose metabolism in cancer cells is believed to function as a compensatory mechanism protecting the cell from hydroperoxides to maintain redox homeostasis. Dr. Fath's research interests involve exploiting these differences in cancer cell metabolism to develop new therapeutic regimens for the treatment of human cancers. The central hypothesis of Dr. Fath's work is to enhance tumor cell killing by using a variety of agents that disrupt the reactive oxygen species balance by either increasing the production of and/or decreasing the detoxification of free radicals within the cancer cell. Dr. Fath uses both cell cultures and mouse xenograft tumor model in her research along with a variety of techniques including enzymatic and biochemical assays and flow cytometry to explore the roll reactive oxygen species plays in cancer cell death. Dr. Fath has a background in pharmacy and chemotherapeutic agents, with specific training and expertise from her post-doctoral training in mouse models of diseases as well as cellular free radical biology.

**Michael Henry, PhD**; Associate Professor, Department of Physiology & Biophysics (319-335-7886) http://www.physiology.uiowa.edu/henry.shtml?menu=1&tab=facultyTab

The long term research goals of the Henry laboratory are to understand the molecular and cellular basis of prostate cancer progression and metastasis in order to develop new methods for the diagnosis and treatment of this disease. Current efforts are focused on the role of a cell-matrix receptor dystroglycan and epithelial-mesenchymal transition in this process. The lab approaches this problem using both cell-based and animal models of disease progression. Emerging interests include how physiological and environmental components interact with central genetic pathways related to disease progression, including the influence of diet-induced obesity. Dr. Henry has extensive experience in basic mechanisms of cell signaling and cancer biology as well as drug discovery and development both in industry and academic settings. His expertise extends from elucidating basic signaling pathways related to cancer progression to various approaches for therapeutic intervention in these pathways including large molecule-targeted delivery of anticancer agents and discovery of small molecule drugs.

**Siegfried Janz, MD**; Professor, Department of Pathology (319-384-2869) http://www.healthcare.uiowa.edu/pathology/site/faculty/janz/janz.html

Siegfried Janz' primary research interest concerns mouse models of human B cell and plasma cell neoplasms that are induced by the deregulated expression of the cellular oncogene MYC (c-myc). His laboratory has recently generated gene-insertion mice that mimic three different states of the human genetic alterations. He is now developing genetic methods for the detection of the homologous Myc-activating translocations in mice. As leader of the Cancer Genetics and Computational Biology Program at the Holden Comprehensive Cancer Center, he is also actively engaged in research on human blood cancers.

**Yi Luo, MD, PhD**; Associate Professor, Department of Urology (319-335-9835) http://www.uihealthcare.com/depts/med/urology/urologymds/luo.html

A major research project in our laboratory is to develop a novel therapeutic strategy to cope with the limitations of the current modalities for prostate cancer treatment. We will use prostate-specific antigen (PSA), a protein known to be aberrantly expressed in prostate cancer, as a target for immunotherapy of prostate cancer. In fact, PSA has been demonstrated to be a useful immunotherapeutic target in clinical trials as well as in animal models. In addition, PSA has also been demonstrated to be antigenic and capable of inducing specific immune responses in both humans and mice. However, up to date, all currently available PSA-targeted immunotherapies have only demonstrated limited antitumor effects. To improve this immunotherapeutic approach, we will use both bacillus Calmette-Guérin (BCG, a bacterial vaccine strain) and adenovirus (Ad, a replication-defective strain) to deliver PSA for animal immunization. Both BCG and Ad microbes have been demonstrated to be safe and effective for antigen delivery in humans and mice. Since these two microbes are known to be different in their infectious modes and host anti-infection responses, rationally combined use of BCG and Ad recombinants for vaccination will provide a

synergistic/complementary immune induction and thus likely result in enhanced antitumor immunity. Indeed, we have previously observed a robust induction of PSA-specific T cell responses by vaccination with combined BCG-PSA (primer vaccine) and Ad-PSA (booster vaccine) in mice. In this study, we will further evaluate the effects of this vaccination method on preventing or treating experimental prostate tumors. The objective of this study is to provide a proof of principle that enhanced antitumor immunity can be achieved by combined vaccination with BCG and Ad recombinants.

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The Norian laboratory studies the causes of tumor-induced immune dysfunction in the presence and absence of obesity and the use of immunotherapies to treat cancers. Immunotherapy is a promising approach for the treatment of advanced solid tumors, but progress in this area is impeded by the fact that growing tumors suppress protective immunity in a variety of ways. Dr. Norian uses cellular and molecular techniques to explore the nature of tumor-derived dendritic cell (DC) and T cell functional deficiencies. Long-term goals are to develop novel, immune-based therapies for advanced solid tumors, using the knowledge we gain from our pre-clinical studies. Because her goal is to ultimately apply findings to the clinical setting, she is also interested in understanding how co-morbidities such as obesity impact protective immune responses in the presence and absence of tumor growth. Due to her affiliation with the Department of Urology, the laboratory has access to clinicians and human samples that can help translate murine studies into clinical application. Murine tumor models routinely used include: metastatic renal cell carcinoma (Renca), localized and metastatic prostate cancer (RM-11), spontaneous breast cancer (NeuT), metastatic breast cancer (4T1), and localized fibrosarcoma (CMS5). The use of multiple models helps to substantiate findings across multiple murine models.

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http://www.medicine.uiowa.edu/Radiology/faculty-staff/faculty/schultz-michael.html

Dr. Schultz is an Assistant Professor at the University of Iowa in the Department of Radiology and a subject matter expert in the molecular design, organic synthesis, characterization, and radiolabeling of peptides and small molecules for small molecule cancer therapy, molecular imaging, and radionuclide therapy for cancer. He has participated in the Lincoln University program for three years and enjoys bringing the students into his lab and mentoring them for the summer session. Dr. Schultz feels that the students bring enthusiasm and provide an excellent opportunity for his graduate researchers to practice mentoring skills and begin to understand the process of teaching science. He has been very pleased with the contribution that the students make to the research efforts of his laboratory. Thus, he finds the program to be highly beneficial to his laboratory and looks forward to further opportunities to participate. The Schultz lab also works to identify key cell-surface receptor residues as targets for novel peptide- and aptamer-based receptor agonists and antagonists — and become proficient in manipulating the molecular characteristics of these targeting vectors in order to optimize their pharmacokinetic and biodistribution properties for imaging and therapy of cancer. An active collaboration exists between Drs. Schultz and Giangrande.

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http://www.public-health.uiowa.edu/faculty-staff/faculty/directory/faculty-detail.asp?emailAddress=elaine-smith@uiowa.edu

Dr. Smith, a recent addition to our mentors, is a Professor of Epidemiology in the College of Public Health. She has a number of research interests that will benefit training of our summer students. These include etiology of oncogenic diseases, focused on molecular epidemiology, HPV effects on the development of genital and other cancers; hormones and risk of HPV detection and replication; HPV and perinatal vertical transmission, head and neck cancers and reproductive diseases: HPV and vestibulitis; prostate cancer risk associated with pesticides and sex steroid hormone alterations.

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**George Weiner, MD**; Professor, Department of Internal Medicine and Director, Holden Comprehensive Cancer Center (319-353-8620)
http://www.healthcare.uiowa.edu/Labs/Weiner/

The laboratory of Dr. George Weiner focuses on exploring methods to enhance the efficacy of monoclonal antibody therapy of cancer. Preclinical and clinical studies are exploring the relative role of various effector cells in antibody dependent cellular cytotoxicity, how complement impacts on the efficacy of monoclonal antibody therapy and how therapy can be improved. Dr. Weiner's laboratory is also evaluating the use of other immunotherapy agents such as immunostimulatory CpG oligodeoxynucleotides (CpG ODN). He works closely with Dr. Brian Link who leads the clinical research aspects of their collaborative research program. Dr. Weiner is the Director of the University of Iowa Holden Comprehensive Cancer Center, and of the Iowa/Mayo Clinic Specialized Program of Research Excellence (SPORE) in lymphoma. He is also the principal investigator of additional research grants from the National Cancer Institute and the Leukemia and Lymphoma Society in the field of immunotherapy of cancer.

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http://www.physiology.uiowa.edu/wright.shtml?menu=1&tab=facultyTab

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cancer. The group is also interested in identifying plasma glycoprotein biomarkers to distinguish indolent and aggressive prostate cancer in patients with organ-confined disease. Overall, the long-term goal of Dr. Wright's research program is to identify prognostic and therapeutic biomarkers in the management and treatment of prostate cancer.

**Nicholas Zavazava, MD, PhD**; Professor, Department of Internal Medicine (319-384-6577) http://www.int-med.uiowa.edu/Divisions/Immunology/Directory/NicholasZavazava.html

The Zavazava laboratory has recently discovered a novel protein, Ym1 which abrogates tumor growth in multiple tumors. They are currently trying to understand the mechanism by which NK cells are activated by this protein. The student from Lincoln will be immersed in these studies. Dr. Zavazava proposes to extend these studies to prostate cancer and determine if this protein can be used as a novel therapeutic agent. This lab has trained many trainees who have moved on to be leaders at a number of institutions. Others have moved on into Pharmaceutical industry. The work in the laboratory has been recognized with several Young Investigator Awards from the American Transplantation Congress. One of our abstracts was rated the best of all abstracts submitted at the 2009 American Transplantation Congress meeting in Boston. Dr. Zavazava currently supervises 3 postdoctoral fellows, 3 graduate students.

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## Living in Iowa City for the Summer

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For additional information please contact one of the following:

David Lubaroff, PhD, Department of Urology, University of Iowa, 375 Newton Road, 3210 MERF, Iowa City, IA 52242; 319-335-8423; david-lubaroff@uiowa.edu

Paul Heidger, PhD, Department of Anatomy & Cell Biology, University of Iowa, 51 Newton Road, Iowa City, IA 52242; 319-335-7722; paul-heidger@uiowa.edu.

Derrick Swinton, PhD, Department of Analytical Chemistry, Lincoln University, 1570 Baltimore Pike, Lincoln University, PA 19352; 484-365-7470; dswinton@lincoln.edu

Karen Baskerville, PhD, Department of Biology, 1570 Baltimore Pike, Lincoln University, PA 19352; 484-365-7507; kbaskerville@lincoln.edu

Diane Morman, Program Coordinator, Department of Urology, University of Iowa, 375 Newton Road, 3209 MERF, Iowa City, IA 52242; 319-335-8425; diane-morman@uiowa.edu

University of Iowa Health Care

Holden Comprehensive Cancer Center

The Lincoln University 1854








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# 2015

# Prostate Cancer Research Summer Training Program

*A Collaboration Between the University of Iowa and The Lincoln University*

Students in the 2014 Program

**Summary of Program:** The partnership of the University of Iowa and The Lincoln University is designed to provide an outstanding atmosphere to train undergraduate students from Lincoln in prostate cancer research. We propose to have twenty-two mentors available for each of the trainees to choose from for their summer research project. The mentors are from seven departments and three colleges at the University of Iowa and the prostate cancer research in their laboratories covers a wide area of interest. The proposed mentors have extensive training experience at all levels; undergraduate, graduate, medical, and postdoctoral.

In addition to the twenty-two faculty mentors both the University of Iowa and Lincoln University have designated Faculty Advisors for the students. Dr. Paul Heidger serves as the advisor at the University of Iowa and Dr. Karen Baskerville and Dr. John Zysk serve as the advisors at Lincoln University. All of the individuals are available for advice and assistance throughout the summer and the regular academic year. The faculty members are listed below as well as a brief description of research in the laboratories of each University of Iowa mentor.

At this point in time the program is 8 weeks long, beginning on Monday, June 8, 2015 and ending on Friday, July 31, 2015.

**Faculty Advisors at Lincoln University:**

**Karen Baskerville, PhD;** Associate Professor and Chair, Department of Biology (484-365-7507)

**John Zysk, PhD;** Assistant Professor and Interim Chair, Department of Chemistry (484-365-7642)

Drs. Baskerville and Zysk are the contact people for the summer program at Lincoln University. They are active in the recruitment, retention, and career planning for our summer students. They also visit the University of Iowa during the summer program.

**University of Iowa Faculty and Their Research**

**Director and Research Mentor: David Lubaroff, PhD**; Professor, Department of Urology & Director of the Summer Research Program (319-335-8423)
http://www.medicine.uiowa.edu/dept_primary.aspx?appointment=Urology&id=907659

The work in this laboratory concentrates on the area of tumor immunology with an emphasis on immunotherapy. We have constructed microbial vaccines to be used for the investigation of gene and immunotherapy of prostate cancer. Investigations on the ability of immunized animals to produce immune responses to the transgene product induced by the vaccine are underway. Additionally, we are carrying our "translational" research in the form of clinical trials of our adenovirus vaccine in men with prostate cancer. Important in these trials is the safety of the vaccine and its ability to induce anti-tumor immunity. We have recently completed a Phase I clinical trial of the vaccine that demonstrated its safety. We have initiated a therapeutic Phase II trial. Finally, we have been collaborating on studies of psychosocial effects on immune status in cancer patients.

**Faculty Advisor: Paul Heidger, PhD;** Emeritus Professor, Dept. of Anatomy & Cell Biology (319-335-7722)
http://www.anatomy.uiowa.edu/personnel.shtml?id=heidgerp

Dr. Heidger will assist in the recruitment and evaluation of summer students and will assist students in career planning. He works with students during the summer to facilitate interviews with members of the graduate training programs, the MD/PhD program, and the Carver College of Medicine.

**Research Mentors**

**Gail Bishop, PhD**; Professor, Department of Microbiology (319-335-7945)
http://immuno.grad.uiowa.edu/faculty/Gail-Bishop

Dr. Bishop is Professor of Microbiology and Internal Medicine and the Holden Chair of Cancer Biology. The Bishop Lab is interested in the molecular mechanisms which underlie the processes of lymphocyte activation and tolerance as well as approaches to the design of better vaccination strategies. In particular, Dr. Bishop is investigating the design of vaccines that maximize the efficacy of B cell activation. Dr. Bishop is currently optimizing the stimuli used in B cell vaccination, and applying this information to vaccination in melanoma and prostate cancer models.

**Robert Cornell, PhD**; Associate Professor, Department of Anatomy & Cell Biology (319-335-8908).
http://neuroscience.grad.uiowa.edu/faculty/robert-cornell

Dr. Cornell is Associate Professor of Anatomy and Cell Biology whose work aims to dissect the gene regulatory networks that govern cell lineage specification, cell survival and cellular differentiation. The Cornell lab group is currently pursuing several major projects that include the Transcription factor Activator Protein-2 (Tfap2) family and networks of regulatory molecules control the expression of genes encoding differentiation effectors are being investigated. Overall, research illuminates the genetic pathways that govern specification, survival, and differentiation of cells. It also provides insight into how

these pathways become disrupted in a variety of disease states, including cancer.

**Eric Devor, PhD**; Research Assistant Professor, Department of Obstetrics & Gynecology (319-335-8212)
http://www.medicine.uiowa.edu/dept_primary_apr.aspx?appointment=Obstetrics%20and%20Gynecology&id=edevor

Current research is focused on the role of a unique protein called placenta-specific 1 (PLAC1) in both gynecologic cancers and gestational disorders such as pre-eclampsia and pre-term birth. PLAC1 is expressed in numerous tissues during fetal development, exclusively in placental trophoblasts in reproductive age women and in gynecologic tumors. It is, thus, the only known example of an onco-fetal-placental protein. The Devor research spans the range of PLAC1 questions from its role in disorders such as those noted above to how the gene is regulated in these various tissues to its detailed evolutionary history in placental mammals.

**Frederick Domann, PhD**; Professor, Department of Radiation Oncology (319-335-8018)
http://molcellbio.grad.uiowa.edu/faculty/frederick-domann

The Domann laboratory focuses on how chromatin structure participates in the transcriptional regulation of cancer related genes including oncogenes and tumor suppressor genes. A gene of particular interest in their laboratory is the tumor suppressor gene SOD2 that encodes the antioxidant enzyme superoxide dismutase. Future research directions will be aimed at elucidating the role of cytosine methylation as a mechanism for inactivation of other genes involved in protection against oxidative damage as well as other classical tumor suppressor genes, and to elucidate the mechanism(s) by which CpG methylation can bring about these changes in gene expression.

**Melissa Fath, PhD**; Assistant Research Scientist, Department of Radiation Oncology (319-335-8025)
http://www.uiowa.edu/~frrbp/secondary/fath.html

Cancer cells have alterations in mitochondrial respiration that are more likely to cause univalent reduction of $O_2$ to form reactive oxygen species, including hydroperoxides, resulting in a chronic condition of metabolic oxidative stress. Increased glucose metabolism in cancer cells is believed to function as a compensatory mechanism protecting the cell from hydroperoxides to maintain redox homeostasis. Dr. Fath's research interests involve exploiting these differences in cancer cell metabolism to develop new therapeutic regimens for the treatment of human cancers. The central hypothesis of Dr. Fath's work is to enhance tumor cell killing by using a variety of agents that disrupt the reactive oxygen species balance by either increasing the production of and/or decreasing the detoxification of free radicals within the cancer cell. Dr. Fath uses both cell cultures and mouse xenograft tumor model in her research along with a variety of techniques including enzymatic and biochemical assays and flow cytometry to explore the roll reactive oxygen species plays in cancer cell death. Dr. Fath has a background in pharmacy and chemotherapeutic agents, with specific training and expertise from her post-doctoral training in mouse models of diseases as well as cellular free radical biology.

**Paloma Giangrande, PhD**; Associate Professor, Department of Internal Medicine (319-384-3243)
http://molcellbio.grad.uiowa.edu/faculty/Paloma-Giangrande

Dr. Giangrande is an Associate Professor in the Hematology/Oncology Division of the Department of Internal Medicine. The long term research goals of the Giangrande laboratory are to develop RNA-based tools to modulate cellular pathways underlying pathological cell proliferation in the setting of cancer. Current efforts are focused on selecting RNA aptamers to antigens expressed on the surface of target prostate cancer cells with SELEX (Systematic Evolution of Ligands by Exponential Enrichment) for the purpose of (1) modulating receptor function and/or (2) delivering therapeutic molecules (e.g. siRNAs, antimers, small molecule drugs) into specific cell types. A major project in the lab is targeted therapy of prostate cancer using PSMA-guided aptamers.

**Prabhat Goswami, PhD**; Professor, Department of Radiation Oncology (319-335-8025)
http://molcellbio.grad.uiowa.edu/faculty/prabhat-goswami

Dr. Goswami is an expert in the redox biology of the cell cycle research. He is well known for his innovative concept of a "*redox cycle within the cell cycle*", linking oxidative metabolic processes to cell cycle regulatory processes. He is the Co-director of the Radiation and Free Radical Research Core of the HCCC and he supervises the Radiation Core facility. Dr. Goswami has published 68 peer reviewed publications and successfully trained 7 PhD graduate students and 3 postdoctoral fellows. Dr. Goswami is currently mentoring 2 PhD, 1 M2, and 2 undergraduate students. Dr. Goswami is a faculty in the Interdisciplinary Molecular and Cellular Biology, and Human Toxicology Graduate Programs.

**Amit Gupta, MD, MPH;** Assistant Professor, Department of Urology (319 384 5251)
https://www.icts.uiowa.edu/Loki/research/browseResearch.jsp?id=229473

Dr. Gupta is an Assistant Professor of Urology with a joint appointment in the Department of Epidemiology in the College of Public Health. Dr Gupta's research interests lie in the Epidemiology and Outcomes of prostate and kidney cancers. Specifically he is interested in the long-term adverse effects of therapy in bladder cancer patients and in PSA screening for prostate cancer. Dr Gupta is currently studying standardization of the PSA assay and how that that may impact decision making in Prostate cancer. He is also studying whether patients undergo appropriate counseling prior to PSA testing. He has published extensively in these areas.

**Siegfried Janz, MD, DSc**; Professor, Department of Pathology (319-384-2869)
http://www.healthcare.uiowa.edu/pathology/site/faculty/janz/janz.html

Siegfried Janz' primary research interest concerns mouse models of human B cell and plasma cell neoplasms that are induced by the deregulated expression of the cellular oncogene MYC (c-myc). His laboratory has recently generated gene-insertion mice that mimic three different states of the human genetic alterations. He is now developing genetic methods for the detection of the homologous Myc-activating translocations in mice. As leader of the Cancer Genetics and Computational Biology Program at the Holden Comprehensive Cancer Center, he is also actively engaged in research on human blood cancers.

**Nitin Karandikar, MD, PhD**; Professor and Chair, Department of Pathology (319-335-7630)
http://www.medicine.uiowa.edu/Karandikar_Lab/

Dr. Karandikar is the Chair and Department Executive Officer, and the Richard G. Lynch Chair in Experimental Pathology. The goal of research in the lab is to understand immune interactions that underlie the pathogenesis and regulation of immune-based diseases. They are also closely involved in several collaborative projects, including *in vitro* allodepletion in hematopoeitic stem cell transplantation to alleviate graft-versus-host disease and mechanistic dissection of immune therapies.

**Yi Luo, MD, PhD**; Associate Professor, Department of Urology (319-335-9835)
http://www.uihealthcare.com/depts/med/urology/urologymds/luo.html

Dr. Luo is an Associate Professor of Urology. A major research project in the Luo laboratory is to develop a novel therapeutic strategy to cope with the limitations of the current modalities for prostate cancer treatment. The lab uses both bacillus Calmette-Guérin (BCG, a bacterial vaccine strain) and adenovirus (Ad, a replication-defective strain) to deliver PSA for animal immunization. Both BCG and Ad microbes have been demonstrated to be safe and effective for antigen delivery in humans and mice. Dr. Luo has previously observed a robust induction of PSA-specific T cell responses by vaccination with combined BCG-PSA (primer vaccine) and Ad-PSA (booster vaccine) in mice.

**Charles Lynch, MD, PhD**; Professor, Department of Epidemiology (319-384-1558)
http://www.medicine.uiowa.edu/dept_secondary_apr.aspx?appointment=Pathology&id=clynch

Dr. Lynch is a Professor in the Department of Epidemiology in the College of Public Health. He is also the Medical Director & Principal Investigator of the State Health Registry of Iowa and the recipient of the 2014 Regents Award for Faculty Excellence for work representing a significant contribution to excellence in public education. His research interests include carcinogenesis, population studies, environmental epidemiology, cancer surveillance, and he is the Principal Investigator of the Agricultural Health Study that demonstrated an increased incidence of prostate cancer in farmers and pesticide applicators. He also maintains the Cancer Center's Cancer Tissue Repository.

**Susan Lutgendorf, PhD;** Professor, Department of Psychology (319-335-2432)
http://psychology.uiowa.edu/people/susan-lutgendorf

Dr. Lutgendorf is Professor & Starch Faculty Fellow in the Department of Psychology. The current focus of the Lutgendorf laboratory investigates how stress is related to tumor growth in cancer patients. They are investigating relationships between life stress and the immune response, angiogenesis, and other mechanisms of tumor growth in ovarian cancer. The goal of this work is to ultimately develop innovative behavioral and pharmacological interventions that may contribute to longer survival in cancer patients.

**Xiangbing Meng, PhD**; Department of Obstetrics and Gynecology (319-335-8212)
http://www.medicine.uiowa.edu/dept_primary_apr.aspx?appointment=Obstetrics%20and%20Gynecology&id=xianmeng

Dr. Meng is a Research Assistant Professor of Obstetrics and Gynecology. His research concentrates on new prognosis biomarkers and potential therapeutic targets in cancer and mitotic catastrophe induction in cancer. Recent publications from Dr. Meng include studies on the induction of mitotic cell death in cancer cells with non-functional p53 and cytoplasmic metadherin (MTDH) provides survival advantage under conditions of stress by acting as RNA-binding protein.

**Lyse Norian, PhD;** Assistant Professor, Department of Urology (319-335-3013)
http://www.medicine.uiowa.edu/dept_primary.aspx?appointment=Urology&id=569305

The Norian laboratory studies the causes of tumor-induced immune dysfunction in the presence and absence of obesity and the use of immunotherapies to treat cancers. Immunotherapy is a promising approach for the treatment of advanced solid tumors, but progress in this area is impeded by the fact that growing tumors suppress protective immunity in a variety of ways. Dr. Norian uses cellular and molecular techniques to explore the nature of tumor-derived dendritic cell (DC) and T cell functional deficiencies. Long-term goals are to develop novel, immune-based therapies for advanced solid tumors, using the knowledge we gain from our pre-clinical studies. Because her goal is to ultimately apply findings to the clinical setting, she is also interested in understanding how co-morbidities such as obesity impact protective immune responses in the presence and absence of tumor growth. Due to her affiliation with the Department of Urology, the laboratory has access to clinicians and human samples that can help translate murine studies into clinical application. Murine tumor models routinely used include: metastatic renal cell carcinoma (Renca), localized and metastatic prostate cancer (RM-11), spontaneous breast cancer (NeuT), metastatic breast cancer (4T1), and localized fibrosarcoma (CMS5). The use of multiple models helps to substantiate findings across multiple murine models.

**Aliasger K. Salem, PhD**; Professor, Division of Pharmaceutics, College of Pharmacy (319-335-8810)
http://www.pharmacy.uiowa.edu/pharmaceutics/people/Salem.htm

Dr. Salem's research interests are primarily focused on self-assembling systems, the rational design of novel drug and gene delivery systems and on the development of sophisticated scaffolds for tissue-specific regeneration. In tissue engineering, Dr. Salem's laboratory applies microfabrication techniques to novel biomaterials to provide spatial control over tissue formation and to integrate minimally invasive scaffold delivery strategies. In drug/gene delivery, he is currently exploring the synergistic application of degradable particle technology, CpG oligonucleotides and heat shock proteins for generating sustained immunotherapeutic responses against cancer. Dr. Salem's laboratory also collaborates with Dr. Lubaroff on the use of microparticles in association with cancer vaccines fro the induction of strong anti-tumor immune responses and tumor destruction.

**Michael Schultz, PhD**; Assistant Professor, Department of Radiology (319-356-4159)
http://www.medicine.uiowa.edu/Radiology/faculty-staff/faculty/schultz-michael.html

Dr. Schultz is an Assistant Professor at the University of Iowa in the Department of Radiology and a subject matter expert in the molecular design, organic synthesis, characterization, and radiolabeling of peptides and small molecules for small molecule cancer therapy, molecular imaging, and radionuclide therapy for cancer. He has participated in the Lincoln University program for three years and enjoys bringing the students into his lab and mentoring them for the summer session. Dr. Schultz feels that the students bring enthusiasm and provide an excellent opportunity for his graduate researchers to practice mentoring skills and begin to understand the process of teaching science. He has been very pleased with the contribution that the students make to the research efforts of his laboratory. Thus, he finds the program to be highly beneficial to his laboratory and looks forward to further opportunities to participate. The Schultz lab also works to identify key cell-surface receptor residues as targets for novel peptide- and aptamer-based receptor agonists and antagonists — and become proficient in manipulating the molecular characteristics of these targeting vectors in order to optimize their pharmacokinetic and biodistribution properties for imaging and therapy of cancer. An active collaboration exists between Drs. Schultz and Giangrande.

**Andrean Simons-Burnett, PhD;** Assistant Professor, Department of Radiation Oncology (319-384-4450)
http://www.medicine.uiowa.edu/dept_primary.aspx?appointment=Pathology&id=435085

Dr. Simons-Burnett has been an active participant in the summer program, previously acting as a "big sister" to students while a member of Dr. Douglas Spitz's laboratory. Her research interests include metabolic oxidative stress in tumors and the role oxidative stress plays in signal transduction pathways. Her current interests focus on the EGFR/PI3K/Akt signaling pathway and its involvement with NADPH oxidase activation, glucose metabolism and autophagy in cancer. Additionally she is interested in investigating novel combined modality therapies that target the EGFR/PI3K/Akt pathway and how one can predict sensitivity to these therapies in cancer disease sites.

**Douglas Spitz, PhD**; Professor, Department of Radiation Oncology (319-335-8001)
http://www.uiowa.edu/~frrbp/spitz_lab.html

Dr. Spitz's laboratory was the first to discover that chronic exposure of mammalian cells to $O^{2\bullet}$- and $H_2O_2$ was capable of inducing genomic instability and gene amplification that resulted in a large increase cellular resistance to oxidative stress associated with cancer therapy. His laboratory was also the first to discover

that glucose deprivation preferentially killed cancer vs. normal cells by metabolic oxidative stress mediated by mitochondrial $O^{2\bullet}$- and $H_2O_2$. In this work his lab also showed that tumor cell mitochondria were producing much greater levels of $O^{2\bullet}$- and $H_2O_2$, relative to normal cells and this apparent defect in cancer cell mitochondrial metabolism could be exploited for therapeutic purposes. This work continues to have a significant impact on the field cancer biology and therapy using ketogenic diets to enhance cancer therapy based on these basic science observations. He has also collaborated on the discovery of the role that Sirt3 plays in maintenance of mitochondrial oxidative metabolism during stress leading to malignant transformation and the fact that MnSOD is a target for Sirt3 activation during ionizing radiation-induced injury relevant to transformation and normal tissue damage during radiotherapy. Dr. Spitz is also a well-established mentor for trainees and junior faculty. He serves as the director of the Biosciences Graduate Program and the Free Radical and Radiation Biology Graduate Program at the University of Iowa as well as the director of the Radiation and Free Radical Research Core Laboratory and the Free Radical Cancer Biology Program in the Holden Comprehensive Cancer Center.

**George Weiner, MD**; Professor, Department of Internal Medicine and Director, Holden Comprehensive Cancer Center (319-353-8620)
http://www.healthcare.uiowa.edu/Labs/Weiner/

The laboratory of Dr. George Weiner focuses on exploring methods to enhance the efficacy of monoclonal antibody therapy of cancer. Preclinical and clinical studies are exploring the relative role of various effector cells in antibody dependent cellular cytotoxicity, how complement impacts on the efficacy of monoclonal antibody therapy and how therapy can be improved. Dr. Weiner's laboratory is also evaluating the use of other immunotherapy agents such as immunostimulatory CpG oligodeoxynucleotides (CpG ODN). He works closely with Dr. Brian Link who leads the clinical research aspects of their collaborative research program. Dr. Weiner is the Director of the University of Iowa Holden Comprehensive Cancer Center, and of the Iowa/Mayo Clinic Specialized Program of Research Excellence (SPORE) in lymphoma. He is also the principal investigator of additional research grants from the National Cancer Institute and the Leukemia and Lymphoma Society in the field of immunotherapy of cancer.

**Michael Wright, PhD**; Assistant Professor, Department of Molecular Physiology & Biophysics (319-384-1764)
http://www.physiology.uiowa.edu/wright.shtml?menu=1&tab=facultyTab

The laboratory of Dr. Wright is applying cutting-edge quantitative mass spectrometry technologies to study cellular signaling at the molecular level in model systems of disease. They are developing novel experimental workflows to globally profile proteins and delineate protein complexes isolated from cells and tissues using directed and targeted mass spectrometry methods. Dr. Wright is particularly interested identifying post-translational modifications on proteins and determining how these modifications control the function, stability, and localization of proteins implicated in human diseases. The lab is elucidating androgen-signaling networks at three primary levels: 1) mapping androgen-sensitive protein pathways, 2) mapping androgen-sensitive kinase pathways, and 3) identifying androgen receptor-interacting protein complexes in model cellular systems of prostate cancer. The group is also interested in identifying plasma glycoprotein biomarkers to distinguish indolent and aggressive prostate cancer in patients with organ-confined disease. Overall, the long-term goal of Dr. Wright's research program is to identify prognostic and therapeutic biomarkers in the management and treatment of prostate cancer.

**Nicholas Zavazava, MD, PhD**; Professor, Department of Internal Medicine (319-384-6577)
http://www.int-med.uiowa.edu/Divisions/Immunology/Directory/NicholasZavazava.html

The Zavazava laboratory has recently discovered a novel protein, Ym1 which abrogates tumor growth in multiple tumors. They are currently trying to understand the mechanism by which NK cells are activated by this protein. The student from Lincoln will be immersed in these studies. Dr. Zavazava proposes to extend these studies to prostate cancer and determine if this protein can be used as a novel therapeutic agent. This lab has trained many trainees who have moved on to be leaders at a number of institutions. Others have moved on into Pharmaceutical industry. The work in the laboratory has been recognized with several Young Investigator Awards from the American Transplantation Congress. One of our abstracts was rated the best of all abstracts submitted at the 2009 American Transplantation Congress meeting in Boston. Dr. Zavazava currently supervises 3 postdoctoral fellows, 3 graduate students.

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**Living in Iowa City for the Summer**

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For additional information please contact one of the following:

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Paul Heidger, PhD; Department of Anatomy & Cell Biology, University of Iowa, 51 Newton Road, Iowa City, IA 52242; 319-335-7722; paul-heidger@uiowa.edu.

Karen Baskerville, PhD; Department of Biology, 1570 Baltimore Pike, Lincoln University, PA 19352; 484-365-7507; kbaskerville@lincoln.edu

John Zysk, PhD; Department of Chemistry, 1570 Baltimore Pike, Lincoln University, PA 19352; 484-356-7642; jzysk@lincoln.edu

Diane Morman; Program Coordinator, Department of Urology, University of Iowa, 375 Newton Road, 3209 MERF, 319-335-8425; diane-morman@uiowa.edu

University of Iowa Health Care

*Holden Comprehensive Cancer Center*

The Lincoln University 1854








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# 2016

# Prostate Cancer Research Summer Training Program

*A Collaboration Between the University of Iowa and The Lincoln University*

Students in the 2015 Program

**Summary of Program:** The partnership of the University of Iowa and The Lincoln University is designed to provide an outstanding atmosphere to train undergraduate students from Lincoln in prostate cancer research. We propose to have twenty-two mentors available for each of the trainees to choose from for their summer research project. The mentors are from seven departments and three colleges at the University of Iowa and the prostate cancer research in their laboratories covers a wide area of interest. The proposed mentors have extensive training experience at all levels; undergraduate, graduate, medical, and postdoctoral.

In addition to the twenty-two faculty mentors both the University of Iowa and Lincoln University have designated Faculty Advisors for the students. Dr. Paul Heidger serves as the advisor at the University of Iowa and Dr. Karen Baskerville and Dr. Derrick Swinton serve as the advisors at Lincoln University. All of the individuals are available for advice and assistance throughout the summer and the regular academic year. The faculty members are listed below as well as a brief description of research in the laboratories of each University of Iowa mentor.

At this point in time the program is 8 weeks long, beginning on Monday, June 6, 2016 and ending on Friday, July 29, 2016.

## Faculty Advisors at Lincoln University:

**Karen Baskerville, PhD;** Associate Professor and Chair, Department of Biology (484-365-7507)

**Derrick Swinton, PhD;** Professor and Dean, College of Science & Technology (484-365-7642)

Drs. Baskerville and Swinton are the contact people for the summer program at Lincoln University. They are active in the recruitment, retention, and career planning for our summer students. They also visit the University of Iowa during the summer program.

## University of Iowa Faculty and Their Research

**Director and Research Mentor: David Lubaroff, PhD**; Professor, Department of Urology & Director of the Summer Research Program (319-335-8423)
http://www.medicine.uiowa.edu/dept_primary.aspx?appointment=Urology&id=907659

The work in this laboratory concentrates on the area of tumor immunology with an emphasis on immunotherapy. We have constructed microbial vaccines to be used for the investigation of gene and immunotherapy of prostate cancer. Investigations on the ability of immunized animals to produce immune responses to the transgene product induced by the vaccine are underway. Additionally, we are carrying our "translational" research in the form of clinical trials of our adenovirus vaccine in men with prostate cancer. Important in these trials is the safety of the vaccine and its ability to induce anti-tumor immunity. We have recently completed a Phase I clinical trial of the vaccine that demonstrated its safety. We have initiated a therapeutic Phase II trial. Finally, we have been collaborating on studies of psychosocial effects on immune status in cancer patients.

**Faculty Advisor: Paul Heidger, PhD;** Emeritus Professor, Dept. of Anatomy & Cell Biology (319-335-7722)
http://www.anatomy.uiowa.edu/personnel.shtml?id=heidgerp

Dr. Heidger will assist in the recruitment and evaluation of summer students and will assist students in career planning. He works with students during the summer to facilitate interviews with members of the graduate training programs, the MD/PhD program, and the Carver College of Medicine.

## Research Mentors - Primary

**James Brown, MD**; Professor, Department of Urology (319-353-7295)
http://www.medicine.uiowa.edu/facultyfocus.aspx?id=3554

Dr. Brown is a Professor in the Department of Urology and the Andersen-Hebbeln Professor of Prostate Cancer Research whose research interests include tumor immunology and prostate cancer genetics. He has been an integral part of the clinical trial team examining the therapeutic effectiveness of the adenovirus/PSA vaccine and a co-investigator on the pending grant application on combining the vaccine with some of the new therapies for castrate-resistant prostate cancer. Dr. Brown is also collaborating with industry partners to identify genetic markers for prostate cancer.

**Paloma Giangrande, PhD**; Associate Professor, Department of Internal Medicine (319-384-3243)
http://molcellbio.grad.uiowa.edu/faculty/Paloma-Giangrande

Dr. Giangrande is an Associate Professor in the Hematology/Oncology Division of the Department of Internal Medicine. The long term research goals of the Giangrande laboratory are to develop RNA-based tools to modulate cellular pathways underlying pathological cell proliferation in the setting of cancer. Current efforts are focused on selecting RNA aptamers to antigens expressed on the surface of target prostate cancer cells with SELEX (Systematic Evolution of Ligands by Exponential Enrichment) for the purpose of (1) modulating receptor function and/or (2) delivering therapeutic molecules (e.g. siRNAs, antimers, small

molecule drugs) into specific cell types. A major project in the lab is targeted therapy of prostate cancer using PSMA-guided aptamers.

**Amit Gupta, MD, MPH;** Assistant Professor, Department of Urology (319 384 5251)
https://www.icts.uiowa.edu/Loki/research/browseResearch.jsp?id=229473
Dr. Gupta is an Assistant Professor of Urology with a joint appointment in the Department of Epidemiology in the College of Public Health. Dr Gupta's research interests lie in the Epidemiology and Outcomes of prostate and kidney cancers. Specifically he is interested in the long-term adverse effects of therapy in bladder cancer patients and in PSA screening for prostate cancer. Dr Gupta is currently studying standardization of the PSA assay and how that that may impact decision making in Prostate cancer. He is also studying whether patients undergo appropriate counseling prior to PSA testing. He has published extensively in these areas.

**Yi Luo, MD, PhD**; Associate Professor, Department of Urology (319-335-9835)
http://www.uihealthcare.com/depts/med/urology/urologymds/luo.html

Dr. Luo is an Associate Professor of Urology. A major research project in the Luo laboratory is to develop a novel therapeutic strategy to cope with the limitations of the current modalities for prostate cancer treatment. The lab uses both bacillus Calmette-Guérin (BCG, a bacterial vaccine strain) and adenovirus (Ad, a replication-defective strain) to deliver PSA for animal immunization. Both BCG and Ad microbes have been demonstrated to be safe and effective for antigen delivery in humans and mice. Dr. Luo has previously observed a robust induction of PSA-specific T cell responses by vaccination with combined BCG-PSA (primer vaccine) and Ad-PSA (booster vaccine) in mice.

**Kenneth Nepple, MD**; Assistant Professor, Department of Urology (319-356-2114)
http://www.medicine.uiowa.edu/dept_primary_apr.aspx?appointment=Urology&id=nepplek

Dr. Nepple is an Assistant Professor in the Department of Urology whose clinical and research interests are in prostate cancer and other genitourinary neoplasms. His primary research interests are in the effects of comorbidities on treatment outcomes, particularly in prostate cancer. He and Dr. Lubaroff are collaborating on the analysis of the comorbidities in the Phase II trial of the adenovirus/PSA vaccine. He is a collaborator on the Phase II trial and a co-investigator on a pending research grant application. Dr. Nepple is new to this SRTP, but has experience in the research training of residents who spend a year of their training on laboratory research projects.

**Hank Qi, MD, PhD**; Assistant Professor, Department of Anatomy & Cell Biology (319-335-3084)
http://www.medicine.uiowa.edu/dept_primary_apr.aspx?appointment=Anatomy%20and%20Cell%20Biology&id=qih

Dr. Qi is an Assistant Professor in the Department of Anatomy and Cell Biology. He uses biochemistry, cell biology, bioinformatics and animal models to study the epigenetic mechanism that involves histone methylation modifications. They focus on the epigenetic role of PHF8 (PHD finger protein 8), a histone demethylase, which removes H4K20me1 (*mono-methylated Histone 4 Lysine 20*) and H3K9me1 at the transcription start site and actively regulates gene expression. Studies in the Qi laboratory are investigating how PHF8 co-ordinates transcription factors and signaling pathways to determine the specificity of transcriptional regulation. They are also studying the PHF8 mediated epigenetic regulation of microRNAs, and are also interested in the functions of histone demethylases in cancer developments. Specifically, they aim to understand how histone demethylase promotes cancer cell transformation and migration, particularly in prostate cancer.

**Aliasger K. Salem, PhD**; Professor, Division of Pharmaceutics, College of Pharmacy (319-335-8810)
http://www.pharmacy.uiowa.edu/pharmaceutics/people/Salem.htm

Dr. Salem's research interests are primarily focused on self-assembling systems, the rational design of novel drug and gene delivery systems and on the development of sophisticated scaffolds for tissue-specific regeneration. In tissue engineering, Dr. Salem's laboratory applies microfabrication techniques to novel biomaterials to provide spatial control over tissue formation and to integrate minimally invasive scaffold delivery strategies. In drug/gene delivery, he is currently exploring the synergistic application of degradable particle technology, CpG oligonucleotides and heat shock proteins for generating sustained immunotherapeutic responses against cancer. Dr. Salem's laboratory also collaborates with Dr. Lubaroff on the use of microparticles in association with cancer vaccines fro the induction of strong anti-tumor immune responses and tumor destruction.

**Christopher Stipp, PhD**: Associate Professor, Department of Biology (319-335-0192)
http://www.medicine.uiowa.edu/dept_secondary_apr.aspx?appointment=Molecular%20Physiology%20and%20Biophysics&id=cstipp

Dr. Stipp in an Associate Professor in the Department of Biology. His research examines how

integrin α3β1 promotes tumor cell adhesion, migration, and invasion on laminin isoforms. Several clinical studies have indicated a correlation between increased tumoral α3β1 integrin expression and tumor progression, metastasis, and poor patient outcomes. However, several other clinical and experimental studies have suggested that α3β1 can possess anti-metastatic activity in certain settings. To help define the range of α3β1 functions in tumor cells in vivo, the Stipp laboratory uses RNAi to silence the α3 integrin subunit in an aggressive, *in vivo*-passaged subline of PC-3 prostate carcinoma cells. Loss of α3 integrin impaired adhesion and proliferation on the α3β1 integrin ligand, laminin-332 *in vitro*. Increased colonization of α3-silenced tumor cells in vivo was recapitulated in 3D collagen co-cultures with lung fibroblasts or pre-osteoblast-like cells, where α3-silenced cells showed dramatically enhanced growth. New data suggest a scenario in which α3β1 regulates tumor-host interactions within the metastatic tumor microenvironment to limit growth, providing some of the first direct evidence that specific loss of α3 function in tumor cells can have pro-metastatic consequences *in vivo*.

**Michael Wright, PhD**; Assistant Professor, Department of Molecular Physiology & Biophysics (319-384-1764)
http://www.physiology.uiowa.edu/wright.shtml?menu=1&tab=facultyTab

The laboratory of Dr. Wright is applying cutting-edge quantitative mass spectrometry technologies to study cellular signaling at the molecular level in model systems of disease. They are developing novel experimental workflows to globally profile proteins and delineate protein complexes isolated from cells and tissues using directed and targeted mass spectrometry methods. Dr. Wright is particularly interested identifying post-translational modifications on proteins and determining how these modifications control the function, stability, and localization of proteins implicated in human diseases. The lab is elucidating androgen-signaling networks at three primary levels: 1) mapping androgen-sensitive protein pathways, 2) mapping androgen-sensitive kinase pathways, and 3) identifying androgen receptor-interacting protein complexes in model cellular systems of prostate cancer. The group is also interested in identifying plasma glycoprotein biomarkers to distinguish indolent and aggressive prostate cancer in patients with organ-confined disease. Overall, the long-term goal of Dr. Wright's research program is to identify prognostic and therapeutic biomarkers in the management and treatment of prostate cancer.

**Yousef Zakharia, MD**; Assistant Professor, Department of Internal Medicine (319-384-8076)
http://www.medicine.uiowa.edu/dept_primary_apr.aspx?appointment=Internal%20Medicine&id=yzakharia

Dr. Zakharia is an Assistant Professor in the Department of Internal Medicine, Division of Hematology, Oncology, and Bone Marrow Transplantation. He is a medical oncologist whose interests include clinical trials for castrate-resistant prostate cancer. Dr. Zakharia and Dr. Lubaroff have begun a new collaboration on the use of the adenovirus/PSA vaccine in combination with the new anti-androgen enzalutamide.

## Additional Research Mentors

**Gail Bishop, PhD**; Professor, Department of Microbiology (319-335-7945)
http://immuno.grad.uiowa.edu/faculty/Gail-Bishop

Molecular mechanisms which underlie the processes of lymphocyte activation and tolerance as well as approaches to the design of better vaccination strategies.

**Robert Cornell, PhD**; Associate Professor, Department of Anatomy & Cell Biology (319-335-8908).
http://neuroscience.grad.uiowa.edu/faculty/robert-cornell

Dissecting the gene regulatory networks that govern cell lineage specification, cell survival and cellular differentiation.

**Eric Devor, PhD**; Research Assistant Professor, Department of Obstetrics & Gynecology (319-335-8212)
http://www.medicine.uiowa.edu/dept_primary_apr.aspx?appointment=Obstetrics%20and%20Gynecology&id=edevor

Role of a unique protein called placenta-specific 1 (PLAC1) in gynecologic cancers

**Frederick Domann, PhD**; Professor, Department of Radiation Oncology (319-335-8018)
http://molcellbio.grad.uiowa.edu/faculty/frederick-domann

How chromatin structure participates in the transcriptional regulation of cancer related genes including oncogenes and tumor suppressor genes.

**Melissa Fath, PhD**; Assistant Research Scientist, Department of Radiation Oncology (319-335-8025)
http://www.uiowa.edu/~frrbp/secondary/fath.html

Exploiting differences in cancer cell metabolism to develop new therapeutic regimens for the treatment of human cancers.

**Prabhat Goswami, PhD**; Professor, Department of Radiation Oncology (319-335-8025)

http://molcellbio.grad.uiowa.edu/faculty/prabhat-goswami

Investigating "*redox cycle within the cell cycle*", linking oxidative metabolic processes to cell cycle regulatory processes.

**Siegfried Janz, MD, DSc**; Professor, Department of Pathology (319-384-2869)
http://www.healthcare.uiowa.edu/pathology/site/faculty/janz/janz.html

Mouse models of human B cell and plasma cell neoplasms that are induced by the deregulated expression of the cellular oncogene MYC (c-myc).

**Nitin Karandikar, MD, PhD**; Professor and Chair, Department of Pathology (319-335-7630)
http://www.medicine.uiowa.edu/Karandikar_Lab/

Understanding immune interactions that underlie the pathogenesis and regulation of immune-based diseases.

**Charles Lynch, MD, PhD**; Professor, Department of Epidemiology (319-384-1558)
http://www.medicine.uiowa.edu/dept_secondary_apr.aspx?appointment=Pathology&id=clynch

Carcinogenesis, population studies, environmental epidemiology, and cancer surveillance,

**Michael Schultz, PhD**; Assistant Professor, Department of Radiology (319-356-4159)
http://www.medicine.uiowa.edu/Radiology/faculty-staff/faculty/schultz-michael.html

Identify key cell-surface receptor residues as targets for novel peptide- and aptamer-based receptor agonists and antagonists — and become proficient in manipulating the molecular characteristics of these targeting vectors in order to optimize their pharmacokinetic and biodistribution properties for imaging and therapy of cancer.

**Andrean Simons-Burnett, PhD;** Assistant Professor, Department of Radiation Oncology (319-384-4450)
http://www.medicine.uiowa.edu/dept_primary.aspx?appointment=Pathology&id=435085

Metabolic oxidative stress in tumors and the role oxidative stress plays in signal transduction pathways.

**Douglas Spitz, PhD**; Professor, Department of Radiation Oncology (319-335-8001)
http://www.uiowa.edu/~frrbp/spitz_lab.html

Cellular resistance to oxidative stress associated with cancer therapy; use of ketogenic diets to enhance cancer therapy based on basic science observations.

**George Weiner, MD**; Professor, Department of Internal Medicine and Director, Holden Comprehensive Cancer Center (319-353-8620)
http://www.healthcare.uiowa.edu/Labs/Weiner/

Evaluating the use of immunotherapy agents such as immunostimulatory CpG oligodeoxynucleotides (CpG ODN) and antibodies.

**Nicholas Zavazava, MD, PhD**; Professor, Department of Internal Medicine (319-384-6577)
http://www.int-med.uiowa.edu/Divisions/Immunology/Directory/NicholasZavazava.html

Understanding the mechanism by which NK cells are activated by a novel protein, Ym1 which abrogates tumor growth in multiple tumors.

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**Research Facilities -** The research laboratories of the faculty mentors at the University of Iowa are located on the west side of Iowa City on the Health Sciences Campus. The facilities include the Medical Laboratories, Bowen Sciences Building, Pharmacy Building, UI General Hospital, Medical Education and Biomedical Research Facility, Carver Biomedical Research Building, and the Veterans Affairs Medical Center. Support for the research is provided by a large number of Shared Core Facilities that include the Gene Transfer Vector Core, DNA Core, Flow Cytometry Core, to name but a few. For research that includes laboratory animals, professional, humane veterinary care is provided by the Animal Care Facilities of the University of Iowa and the Veterans Affairs Medical Center.

**Opportunities for Learning -** Students will have a large number of opportunities to learn about research, prostate cancer, and cancer in general. These include meeting with other members of the HBCU SRT and mentors, joint laboratory meetings with other investigators collaborating with the mentor, journal clubs, and a six-week course designed to educate the students about prostate cancer, its origins, genetics, epidemiology, and treatment.

**Living in Iowa City for the Summer**

**Housing and Meals** - All students will be housed in the one of the residence halls on the campus of the University of Iowa. It will be conveniently located on the west campus near the research labs and is served by the free Cambus transportation system.

**Arrival and Welcome** – For the 8 week program, students will be expected to arrive on Sunday, June 5 2016. Flights by most major airlines are available to the Cedar Rapids Eastern Iowa Airport (CID). These include American, Delta, and United Airlines. We will

make flight plans for you. A welcoming barbecue will be held on Sunday, June 5th with members of other summer research programs that include the Iowa Biosciences Advantage, and the Student Summer Research Opportunities Program.

**Activities In and Around Iowa City -** There are a number of activities in the Iowa City Area that students can find during the summer research program. These include, but are not limited to, the following:

*Friday and Saturday Night Concert Series* – Free musical concerts held each Friday and Saturday night from 6:30 to 9:30 pm on the downtown Pedestrian Mall.

*Iowa City Jazz Festival* – A free, three-day jazz concert featuring local, regional, and national jazz groups during the July 4th celebration. The festival will be held on the Pentacrest on the campus of the University of Iowa.

*Saturday Night Free Movies Series* – This is the newest addition to Iowa City's long tradition of free, outdoor family-friendly entertainment that literally brings our community together. It is held outdoors on the Pentacrest from June through August.

*Other Activities* – there are a large number of indoor & outdoor activities that can be accessed through the Cities of Iowa City and Coralville and the University of Iowa. These include exercise facilities (running, tennis, basketball, volleyball, handball/racquetball, weights, biking, and swimming), local beaches, and museums (art, natural history, and sports). In addition, there are a large number of restaurants ranging from fast food to fine dining.

**Application to the Program -** Application forms, distributed with this brochure, must be completed and returned either to Dr. Baskerville or Dr. Swinton at Lincoln University or to Dr. Lubaroff at the University of Iowa. **The deadline for submission is March 4, 2016.** A committee composed of Dr. Baskerville, Dr. Swinton, Dr. Lubaroff, Dr. Heidger and two additional faculty from the University of Iowa will meet and make final decisions. Students will be notified of the decisions no later than March 18, 2016 pending prompt receipt of all applications.

**Financial Support -** The housing and transportation costs will be paid by the program. Each student will receive a food allowance. In addition, each student will be provided a stipend, the amount of which is currently being negotiated with the University of Iowa and Lincoln University.

For additional information please contact one of the following:

David Lubaroff, PhD; Department of Urology, University of Iowa, 375 Newton Road, 3210 MERF, Iowa City, IA 52242; 319-335-8423; david-lubaroff@uiowa.edu

Paul Heidger, PhD; Department of Anatomy & Cell Biology, University of Iowa, 51 Newton Road, Iowa City, IA 52242; 319-335-7722; paul-heidger@uiowa.edu.

Karen Baskerville, PhD; Department of Biology, 1570 Baltimore Pike, Lincoln University, PA 19352; 484-365-7507; kbaskerville@lincoln.edu

Derrick Swinton, PhD; Office of the Dean, College of Science & Technology, 1570 Baltimore Pike, Lincoln University, PA 19352; 484-356-7642; jzysk@lincoln.edu

Diane Morman; Program Coordinator, Department of Urology, University of Iowa, 375 Newton Road, 3209 MERF, 319-335-8425; diane-morman@uiowa.edu

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